Regional Scope Document

ELECTRONICS (Secondary)2009

Technical Committee:

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Purpose of the Challenge: Duration: 4 Hours

To encourage participation in the exciting field of electronics.

Skills & Knowledge to be Tested:

The competition is based on practical assignments (85 %) with the remainder (15%) on purely theoretical assignments.

The contest will cover the theoretical and practical aspects of current High-school Electronics curriculum. The competitors are not limited to, but **may** be asked to demonstrate abilities in the following areas:

- Interpret electronic schematic diagrams, pictorials, manufacturer's technical specifications.
- Identify common electrical and electronic components.
- Construct, analyse and troubleshoot DC circuits.
- Solder components on a printed circuit board.
- Bread-boarding electronic circuits.
- Be able to use a Digital Multi-meter.
- Reverse Engineering a simple electronic circuit.

Safety Requirements:

Safety awareness/requirements will be maintained at, at least minimum industry standards at all times. A contestant will not be allowed to compete without the safety equipment noted on this scope document.

Equipment / Tools / Materials

Supplied by Committee:

Bench equipment:
Power Supply 0 to 15 Volts @ 1 amp
Digital Multi-meter
Oscilloscope if available

- Projects and Documentation:
  To comply with the recommendations made by the Provincial Technical Committee the project documentation will be released only at the competition.

Supplied by Contestant:

- Hand Tools: 25 to 35 watt soldering iron, soldering iron stand, tips of choice and tip cleaner. Gas soldering devices will **not** be allowed.
  Hand vacuum solder extractor or Solder Wick
  Long nose pliers
  Side Cutters
  Wire Stripper
  Screwdrivers
  "Third Hand" or similar bench vice including magnifying glass.
  Power bar with 4 or more outlets.

- Miscellaneous: Pens, Pencils, Eraser, Ruler
  Non-programmable calculator. The judges will inspect the calculator for suitability.
  Safety Glasses/Goggles
  2 breadboards, minimum size each, 2"x 6". (wire will be supplied)
  Desk Lamp (optional)

Clothing Requirements:

Competitors are to be dressed in a clean and safe manner.
Competitors may be asked to remove jewellery that judges consider unsafe.
Competitors wishing to block out some of the noise from other competitions may use hearing protectors.
Competitors will **not** be allowed to use personal entertainment devises such as CD or MP3 players during the competition.

Judging / Distribution of Marks:

Competitors will be marked objectively in the following areas:

Circuit analysis "Questions"	15%
Project(s) assembly and testing	30%
Reverse Engineering	25%
Breadboarding technique	30%

ADDITIONAL COMPETITION NOTES:

- In the event of a tie in the evaluation, the tie will be broken by the mark achieved on the following project sections:

  Bread-boarding
  Reverse Engineering
  Project Assembly and Testing

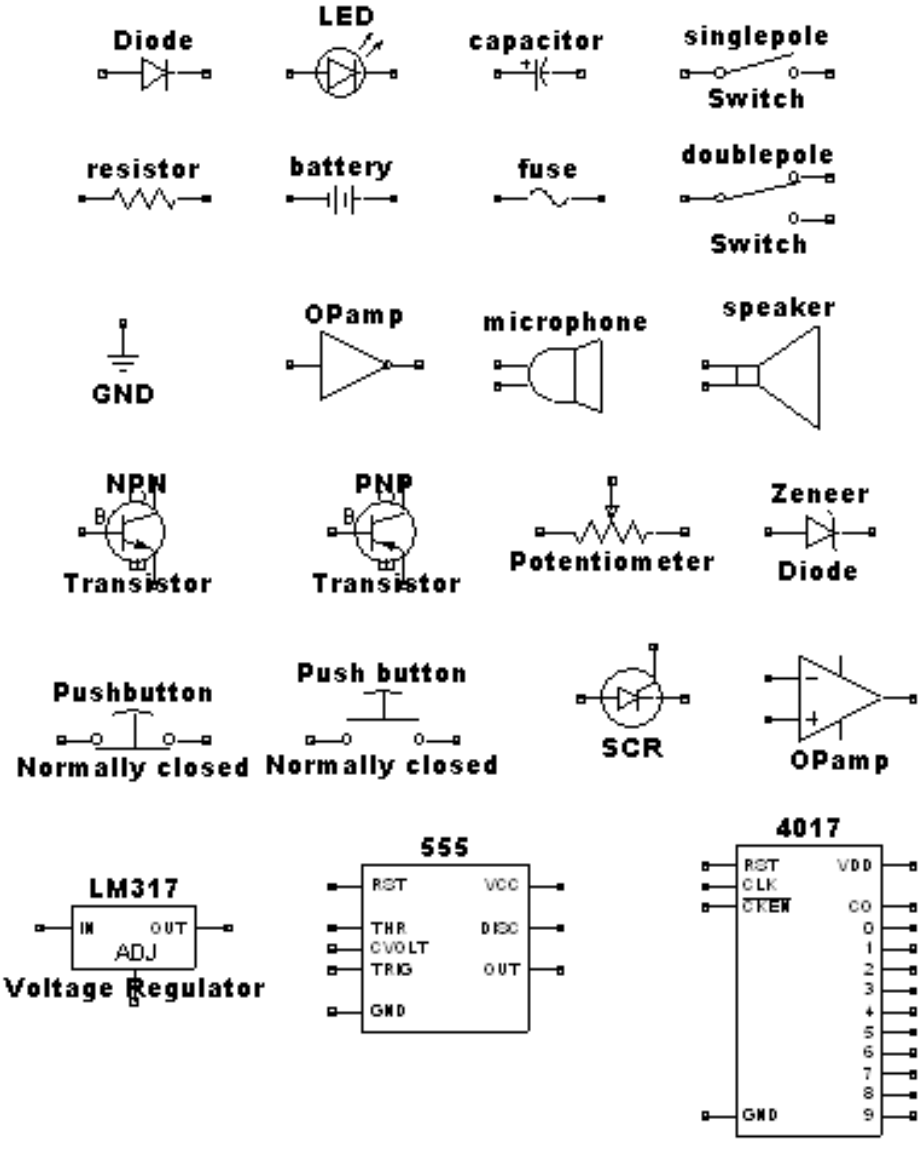
- Competition documents will be available to the competitor only at the time of competition and must be returned to the organizer upon completion.
- Safety glasses **must** be worn during soldering sessions. Failure to comply with this requirement may lead to disqualification.

Standards used at the Provincial and International Competitions may be of interest to competitors. See the trade 16 scope and documents at: www.worldskills.com , or the provincial scope.

- Please see attached teaching standards for Schematic drawings and Breadboarding.

Commonly used schematic symbols

Taken from DipTrace, schematic drawing program



Breadboarding Standards

1. Connect positive voltage (V+) from the power supply, to the left most hole of the breadboard's upper power bus.
2. Connect Common, from the power supply, to the left most hole on the breadboard's lower power bus.
3. On boards with two upper and lower busses (quad bus breadboards) use the inner buses.
4. Connect a voltmeter to the power bus at the right end of the board.
5. NEVER connect both V+ and common to the top and bottom of a quad breadboard. The breadboard circuit layout should be as close as possible to what would be a printed circuit board layout. One never routes the buses beside each other or under each other.
6. IC number should go from left to right (U1 to Un) on the breadboard. Start the layout near the left side and place IC's reasonably close together.
7. Wiring should be kept back as far as possible from I.C.'s and switches. Work from the outside of the board toward the center. This allows for IC removal and clear access to the IC pins for troubleshooting.
8. The amount of bare wire exposed above the board should not exceed 1mm.
9. Place components on the breadboard in a visually pleasing manner, as closely as possible to the layout on the schematic. This makes troubleshooting easier.
10. Leaded components (resistor, capacitors, diodes) should be mounted either vertically or horizontally (not diagonally), and oriented in a consistent direction (i.e., with the first band of the color code, anode, or cathode at the top or on the left). Transistors should each be mounted into three consecutive rows (or every other row) with the identification markings facing the ground bus.
11. Use as few wires with as many colours as possible.
12. Wires should be as short as possible while considering the following:
    a. Wires that must cross over an IC should be long enough that they can be pushed out of the way so that the IC maybe removed without pulling out any wires
    b. Do not use multiple wires to form one connection
    c. Wires should not rise more than 2.5 cm above the board
    d. Wires that are used to connect two pins together should be long enough so that they can be easily inserted and removed
    e. Try to run the wires vertically and horizontally, avoiding diagonal runs.

Schematic Drawing standards

From Wikipedia, the free encyclopedia

A **Schematic diagram** is a simplified conventional pictorial representation of an electrical circuit. It shows the different components of the circuit as simplified standard symbols, and the power and signal connections between the devices. Arrangement of the components interconnections on the diagram does not correspond to their physical locations in the finished device.

Legends

On a circuit diagram, the symbols for components are labelled with a descriptor (or reference designation) matching that on the list of parts. For example, C1 is the first capacitor, L1 is the first inductor, Q1 is the first transistor, and R1 is the first resistor (note that it isn't written R_1, L_1,…). The letters that precede the numbers were chosen in the early days of the electrical industry, even before the vacuum tube (thermionic valve), so "Q" was the only one available for semiconductor devices in the mid-twentieth century . Often the value or type designation of the component is given on the diagram beside the part, but detailed specifications would go on the parts list.

Symbols

Circuit diagram symbols have differed from country to country and have changed over time, but are now to a large extent internationally standardized.

Linkages

Schematic wire junctions:
With the arrival of computerized drafting, a connection of two intersecting wires was shown by a crossing with a dot or "blob", and a crossover of insulated wires by a simple crossing without a dot. However, there was a danger of confusing these two representations if the dot was drawn too small or omitted. Modern practice is to avoid using the "crossover with dot" symbol, and to draw the wires meeting at two points instead of one. It is also common to use a hybrid style, showing connections as a cross with a dot while insulated crossings use the semicircle.

Organization of drawings

It is a usual although not universal convention that schematic drawings are organized on the page from left to right and top to bottom in the same sequence as the flow of the main signal or power path. For example, a schematic for a radio receiver might start with the antenna input at the left of the page and end with the loudspeaker at the right. Positive power supply connections for each stage would be shown towards the top of the page, with grounds, negative supplies, or other return paths towards the bottom.